# ART20C Pressure Independant Control Valve (PICV)


## Technical Data and Installation Instructions



Dimensions in mm

# ART20C Pressure Independant Control Valve (PICV)

## PN 25

**Main features:**

ART20C is used for balancing the flow in cooling, heating and domestic water systems.
ART20C is an automatic balancing valve with following features:

- Easy required flow rate selection using presetting dial;
- Automatic balancing in the event of fluctuating pressure conditions in system branches;
- Flow rate modulation along the whole actuator stroke;
- Flexibility if the system is modified after the first installation;
- Reduction of balancing costs, improved energy saving and high environmental comfort;

It is supplied with external thread.
It is made of "CR" brass ("CR" - Corrosion Resistant).
This article is made in compliance with the quality management requirements of ISO 9001:2008 standard. All articles are tested according to the EN 12266-1:2003 standard.
It can be used in a wide variety of sectors: heating, air conditioning, water, sanitary systems and generally with any non corrosive liquid.

**Technical data:**

| | |
|---|---|
| Max. static working pressure | 25 bar |
| Max. differential pressure | 4 bar (400 kPa) |
| Max. flow temperature | 120 °C |
| Min. temperature | -10°C |
| Fluids: | Water and Glycol |
| Material of parts in contact with water: | |
| | Valve body; |
| | Shutter, etc. |
| Materials: | |
| | "CR"Brass (EN 12165-CW602N-M) |
| O-rings: | EPDM Perox |
| Threads: | ISO 228 |

**Approved by:**



Dimensions in mm

# ART20C Pressure Independant Control Valve (PICV)

**Models:**

| ART20CLF - Pressure independent control valve - PN 25 - "CR" Brass - Low Flow | | | | | | |
|---|---|---|---|---|---|---|
| | | | Flow rate range | | | |
| DN | Material | Thread | (l/s) | (l/h) | (GPM) | Part code |
| 10 | CR Brass EN 12165-CW602N-M | G. 1/2" | 0.012 ÷ 0.042 | 43 ÷ 150 | 0.19 ÷ 0.66 | ADPI20CLF038 |
| 15 | | G. 3/4" | 0.024 ÷ 0.097 | 86 ÷ 347 | 0.37 ÷ 1.53 | ADPI20CLF050 |
| - | | - | - | - | - | - |
| - | | - | - | - | - | - |

| ART20CHF - Pressure independent control valve - PN 25 - "CR" Brass - High Flow | | | | | | |
|---|---|---|---|---|---|---|
| | | | Flow rate range | | | |
| DN | Material | Thread | (l/s) | (l/h) | (GPM) | Part code |
| 10 | CR Brass EN 12165-CW602N-M | G. 1/2" | 0.024 ÷ 0.097 | 86 ÷ 347 | 0.37 ÷ 1.53 | ADPI20CHF038 |
| 15 | | G. 3/4" | 0.027 ÷ 0.134 | 96 ÷ 483 | 0.42 ÷ 2.13 | ADPI20CHF050 |
| 20 | | G. 1" | 0.042 ÷ 0.250 | 150 ÷ 900 | 0.66 ÷ 3.96 | ADPI20CHF075 |
| 25 | | G. 1"1/4 | 0.076 ÷ 0.447 | 272 ÷ 1610 | 1.20 ÷ 7.09 | ADPI20CHF100 |

| ART 20U Union Tail Pieces for ART 20C DN10-25 (U=Union connection) | | | |
|---|---|---|---|
| DN | Item | Description | Part Code |
| 10 | DN10 2 piece union + gasket | G 1/2" To pipe R3/8" BSPM (2 reqd per valve) | ADPI20CU038 |
| 15 | DN15 2 piece union + gasket | G 3/4" To pipe R1/2" BSPM (2 reqd per valve) | ADPI20CU050 |
| 20 | DN20 2 piece union + gasket | G 1" To pipe R3/4" BSPM (2 reqd per valve) | ADPI20CU075 |
| 25 | DN25 2 piece union + gasket | G 1 1/4" To pipe R1" BSPM (2 reqd per valve) | ADPI20CU100 |

**Actuators:**

ART20C is designed to be upgraded with different type of actuators to open, close and modulate the valve on circuit.

<u>DN 15-25</u>
Different types of actuators are available, as follows:

- Motorised Gear Actuators
  - C23E: operating voltage 24 V AC 0...10 V DC control signal;
  - C21V: operating voltage 24 V AC - 3-position control signal;
  - C22V: operating voltage 230 V AC - 3-position control signal;

- Thermoelectric Actuators:
  - EMV311/NC 24: operating voltage 24 V AC - Normally closed;
  - EMV311/NV 230: operating voltage 230 V AC - Normally closed;
  - EMV311/NO 24: operating voltage 24 V AC - Normally open;
  - EMV311/NO 230: operating voltage 230 V AC - Normally open;
  - EMV311/PRO: operating voltage 24 V AC - Normally closed - 0...10 V DC control signal;

- Thermostatic Head
  - EMV299/100: operating temperatures 20-60°C



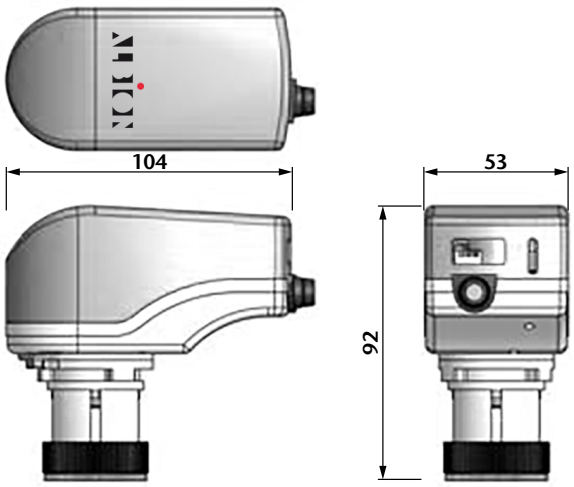
Dimensions in mm

# ART20C Pressure Independant Control Valve (PICV)

| Model | EMV311/NC 24 | EMV311/NC 230 | EMV311/NO 24 | EMV311/NO 230 | EMV311/PRO |
|---|---|---|---|---|---|
| Technical code | RC09600000 | RC09680000 | RC09690000 | RC09700000 | RC11010000 |
| Voltage | 24 V AC | 230 V AC | 24 V AC | 230 V AC | 24 V AC |
| Control | On/Off -N.C. | On/Off -N.C. | On/Off – N.O. | On/Off – N.O. | Proportional 0-10 VDC N.C. |
| Frequency | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| Power | 2.5 W | 2.5 W | 2.5 W | 2.5 W | 2.5 W |
| Closing and opening times | 5 min | 3 min | 5 min | 3 min | 30 sec/mm |
| Degree / Class of protection | IP54/II | IP54/II | IP54/II | IP54/II | IP54/II |
| Actuator stroke | 4.5 mm | 4.5 mm | 4.5 mm | 4.5 mm | 4.5 mm |
| Actuating force | 160 N | 160 N | 160 N | 160 N | 160 N |
| Cable length | 1 m | 1 m | 1 m | 1 m | 1 m |
| Connection | M30x1.5 | M30x1.5 | M30x1.5 | M30x1.5 | M30x1.5 |

| Model | C23E | C21V | C22V |
|---|---|---|---|
| Technical code | ADPI20C23EN | ADPI20C21VN | ADPI20C22VN |
| Voltage | 24 V AC | 24 V AC | 230 V AC |
| Control signal | 0-10Vdc/4-20mA | 3 position | 3 position |
| Frequency | 50 Hz | 50 Hz | 50 Hz |
| Power | 5 VA | 5 VA | 5 VA |
| Open/Close time | 18.5 sec/mm | 18.5 sec/mm | 18.5 sec/mm |
| Degree / Class of protection | IP54 | IP54 | IP54 |
| Actuator stroke | 6.5 mm | 6.5 mm | 6.5 mm |
| Actuating force | 200 N | 200 N | 200 N |
| Cable length | 1 m | 1 m | 1 m |
| Connection | M30x1.5 | M30x1.5 | M30x1.5 |

| Model | EMV299/100 |
|---|---|
| Technical code | RC09610000 |
| Temperature | 20-60°C |
| Sensor length | 2 m |
| Connection | M30x1.5 |




Dimensions are for C21V-23E only.

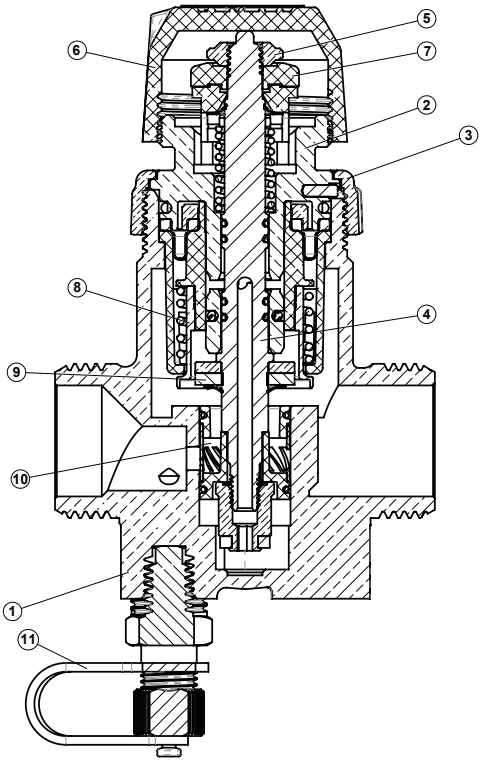


Dimensions in mm

# ART20C Pressure Independant Control Valve (PICV)

**Cross section:**

1. Valve body
2. Bonnet
3. Fixing ring
4. Stem
5. Locking nut
6. Plastic cap
7. Dial
8. DPC controller
9. Gasket
10. Regulator
11. Binder



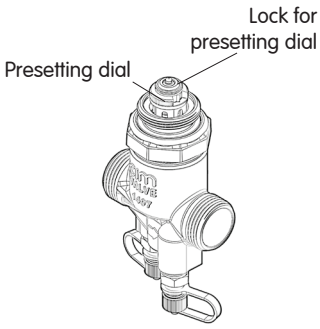

**Installation procedure:**

Before installation of ART20C, check that inside the valve and the pipes there are no foreign matters which might damage the tightness of the valve.
Make sure that required flow rate is within operating range of the valve. Valves may be installed either on horizontal or vertical pipelines with the electric actuator faced-up and following the arrow direction casted on the valve body, which shall be the same as the flow one.
For assembly purposes, use a spanner, not a pipe wrench, by applying necessary working torque.
The valve is supplied with a cap allowing (when screwed) the manual closing of the valve.



Dimensions in mm

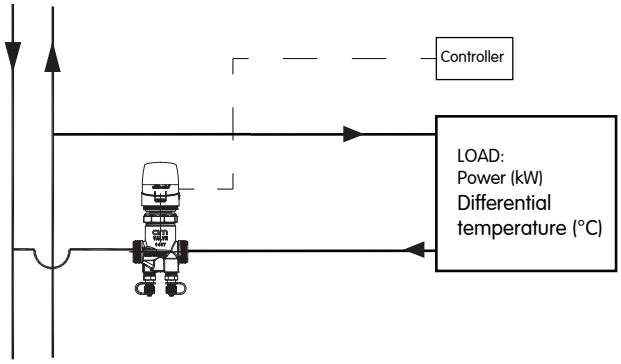
**Balancing:**




Take the plastic cap screwed on the upper part of the valve off. Turn the presetting dial device (see picture) and match the mark on the swivel part with the value stated on the fixed part of said device (1, 2, 3, etc.), which shall correspond to required flow rate. Do not exceed the working setting range (1-5).
The relation between flow rate and values shown on the presetting dial device are given by the tables stated on following pages of this data sheet.
Using a differential manometer, check that the differential pressure is higher or the same as the minimum value reported in said tables. The differential manometer interfaces with the balancing valve through the two binder points of the valve.
When balancing is achieved, screw the lock for presetting dial completely, preventing any unintentional rotation.

**Typical installations:**

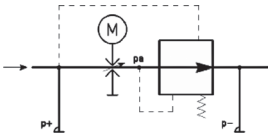
ART20C is suitable for variable volume system to control fan coil flow rate directly. Below a typical installation: in each moment the flow rate is the required one and there will be no extra-flow due to the pressure fluctuations.






Dimensions in mm

## Sizing:




Thanks to their unique design, these valves are able to perform the following functions:

- REGULATION: selection of required flow rate within the operating range;
  When electric actuator or plastic cap is missing, the valve is normally open. On the contrary, if plastic cap is screwed or electric actuator installed therein, they overcome the force of the spring and close the valve. The inlet water goes through a modulating control component whose geometry can be modified by turning the presetting dial, according to the required flow rate in the system branch where the valve is installed.

- CONTROL: constant flow rate despite of pressure fluctuations;
  Two different pressures operate on the DPC bonnet. The first one is transmitted through the passage connecting the valve inlet to the higher section of the valve (see hydraulic schematic); the second one is registered at valve outlet by the flow rate selecting device "pa". In order to keep constant the difference between the mentioned pressures, the DPC bonnet obturator operates by closing the water outlet bore to reach the preset flow rate, regardless of fluctuating pressure conditions of the system.

- MODULATION: "Full authority" flow rate modulation for room temperature control ;
  The actuator performs the modulating function changing the section of flow passage. When continuous modulation is carried out, the temperature is kept under control. ART20C keeps the same obturator stroke, regardless of the presetting dial position. With continuous modulation, control is excellent even with small flow opening. This eliminates on/off effect.

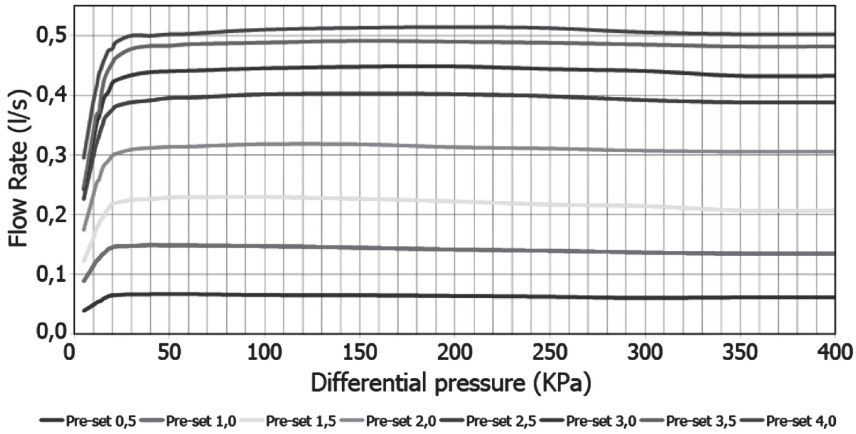
Constant flow is obtained through the valve, despite pressure fluctuations.
By simply measuring differential pressure across the valve, the flow through the cartridge is obtained as follows:

- If measured differential pressure is above $\Delta p_{min}$ (start-up pressure), the flow rate is the same as the one stated on the valve table (function) of the pre-set;
- If measured differential pressure is below minimum $\Delta p_{min}$ stated on valve table, flow rate is calculated with one of the following formula:

$$Q = Kvs \cdot \sqrt{\frac{\Delta p}{r}}$$

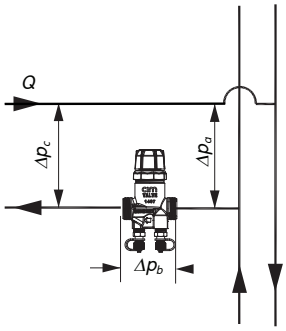
where:
Q is the flow rate in $m^3/h$, r is the relative density, $\Delta p$ is the pressure drop across the valve;
Kvs - Kv across the valve when it is fully open (see tables).

| Relative density | |
|---|---|
| Fluid | r |
| Water | 1.000 |
| Water and glycol 10% | 1.012 |
| Water and glycol 20% | 1.028 |
| Water and glycol 30% | 1.040 |
| Water and glycol 40% | 1.054 |
| Water and glycol 50% | 1.067 |






Dimensions in mm




$\Delta p_a = \Delta p_b + \Delta p_c$

$\Delta p_b$ *Pressure drop across ART20C*
$\Delta p_c$ *Circuit pressure drop*
$\Delta p_a$ *Available pressure for the riser*

SUGGESTED VALUES AND TIPS:

- Velocities in the pipeline:
  Max = 1.15 m/s
  Min = 0.75 m/s

For the preliminary sizings where the value of maximum available pressure is not known, it is possible to use the maximum head of the pump directly.

EXAMPLE

It is required to balance the circuit in the figure, the given data are:

- Circuit pressure drop: $\Delta p_c$=10 kPa;
- Flow rate: Q= 0.23 m³/h=0.064 l/s;
- Maximum head: $\Delta p_{a,max}$ = 60 kPa (Pump head);
- Pipeline size:1/2"- DN15.

It is possible to install a valve with the same diameter of the pipe. Using a ART20C 3/4" - DN15, it is possible to select from the attached tables the pre-set position (Set 2.4 - 0.0645 l/s).
This P.I.C.V. in this conditions needs at least 14 kPa of differential pressure in order to work properly, the available pressure on the riser should be at least:

$$\Delta p_a = \Delta p_b + \Delta p_c = 14 + 10 = 24\ kPa$$

The maximum allowable differential pressure across the balancing valve is 400 kPa, it means that the maximum head at the riser should be:

$$\Delta p_a = \Delta p_b + \Delta p_c = 410 + 10 = 410\ kPa$$

Being the maximum head less than the calculated limit, the installation is correct.



Dimensions in mm

## Measurement conversion chart:

### Pressure

| FROM | MULTIPLY BY | TO OBTAIN |
|---|---|---|
| Pa, Pascal | 0,001 | kPa, kiloPascal |
| Pa, Pascal | 0,000001 | MPa, Mega Pascal |
| Pa, Pascal | 0,00001 | bar |
| Pa, Pascal | 0,00010972 | $m_{H2O}$, metres of water |
| Pa, Pascal | 0,000145038 | psi, pound per square inch |
| bar | 1,01325 | atm, atmosphere |
| bar | 0,980665 | Kg/cm$^2$, kilograms per square centimetre |
| bar | 10,1972 | $m_{H2O}$, metres of water |
| bar | 14,5038 | psi, pound per square inch |
| atm, atmosphere | 1,03323 | Kg/cm$^2$, kilograms per square centimetre |
| atm, atmosphere | 10,3323 | $m_{H2O}$, metres of water |
| atm, atmosphere | 14,6959 | psi, pound per square inch |
| Kg/cm$^2$ | 10 | $m_{H2O}$, metres of water |
| Kg/cm$^2$ | 14,2233 | psi, pound per square inch |
| $m_{H2O}$ | 1,42233 | psi, pound per square inch |

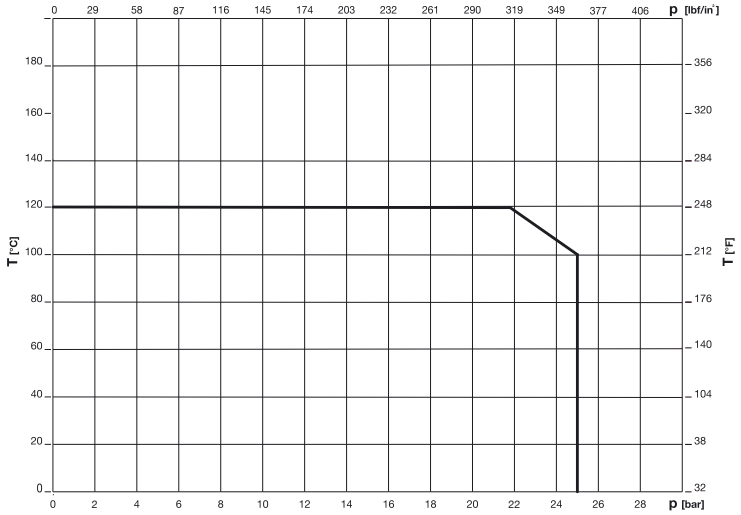
TO OBTAIN — DIVIDE BY — FROM

### Length, Area, Volume, Density

| FROM | MULTIPLY BY | TO OBTAIN |
|---|---|---|
| inches | 0,0254 | m, metres |
| inches | 2,54 | cm, centimetres |
| feet | 0,3048 | m, metres |
| feet | 30,48 | cm, centimetres |
| yards | 0,9144 | m, metres |
| square inches | 0,00064516 | m$^2$, metri quadrati |
| square feet | 0,09290304 | m$^2$, square metres |
| square inches | 6,4516 | cm$^2$, square centimetres |
| square feet | 929,0304 | cm$^2$, square centimetres |
| square yards | 0,8361274 | m$^2$, square metres |
| l, litres | 0,001 | m$^3$, cubic metres |
| gallons | 0,003789412 | m$^3$, cubic metres |
| cubic yards | 0,7645549 | m$^3$, cubic metres |
| cubic feet | 0,02831685 | m$^3$, cubic metres |
| cubic inches | 0,0000164 | m$^3$, cubic metres |
| cubic inches | 16,38706 | cm$^3$, cubic centimetres |
| cubic feet | 28,31685 | l, litres |
| gallons | 3,875412 | l, litres |

TO OBTAIN — DIVIDE BY — FROM

## Pressure-temperature ratings:

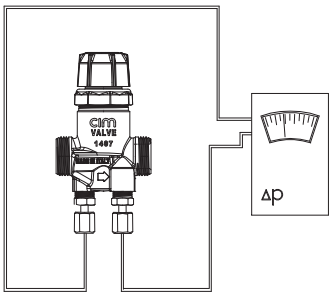





Dimensions in mm

## Flow rates - 1/2" DN 10

ART20C LF




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$
$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 43 | 47 | 55 | 63 | 72 | 79 |
| | l/s | 0.012 | 0.013 | 0.015 | 0.018 | 0.020 | 0.022 |
| | GPM | 0.19 | 0.21 | 0.24 | 0.28 | 0.32 | 0.35 |
| Min Δp kPa | | 15 | 15 | 15 | 15 | 15 | 15 |
| Kvs | | 0.11 | 0.12 | 0.14 | 0.16 | 0.18 | 0.20 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 79 | 85 | 90 | 93 | 96 | 99 |
| | l/s | 0.022 | 0.024 | 0.025 | 0.026 | 0.027 | 0.027 |
| | GPM | 0.35 | 0.37 | 0.40 | 0.41 | 0.42 | 0.43 |
| Min Δp kPa | | 15 | 15 | 15 | 15 | 15 | 16 |
| Kvs | | 0.20 | 0.22 | 0.23 | 0.24 | 0.24 | 0.25 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 99 | 101 | 104 | 108 | 113 | 119 |
| | l/s | 0.027 | 0.028 | 0.029 | 0.030 | 0.031 | 0.033 |
| | GPM | 0.43 | 0.45 | 0.46 | 0.48 | 0.50 | 0.52 |
| Min Δp kPa | | 16 | 16 | 16 | 16 | 16 | 16 |
| Kvs | | 0.25 | 0.25 | 0.26 | 0.27 | 0.28 | 0.30 |

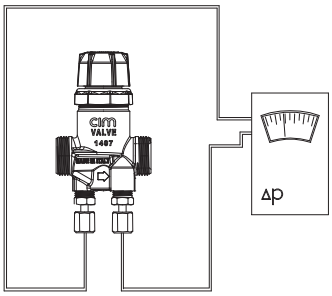
| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 119 | 126 | 133 | 140 | 146 | 150 |
| | l/s | 0.033 | 0.035 | 0.037 | 0.039 | 0.040 | 0.042 |
| | GPM | 0.52 | 0.55 | 0.59 | 0.62 | 0.64 | 0.66 |
| Min Δp kPa | | 16 | 16 | 16 | 16 | 16 | 16 |
| Kvs | | 0.30 | 0.31 | 0.33 | 0.35 | 0.36 | 0.37 |



Dimensions in mm

## Flow rates - 1/2" DN10

ART20C HF




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$

$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 86 | 102 | 122 | 143 | 172 | 194 |
| | l/s | 0.024 | 0.028 | 0.034 | 0.040 | 0.048 | 0.054 |
| | GPM | 0.38 | 0.45 | 0.54 | 0.63 | 0.76 | 0.85 |
| Min Δp kPa | | 13 | 13 | 13.5 | 13.5 | 14 | 14 |
| Kvs | | 0.24 | 0.28 | 0.33 | 0.39 | 0.46 | 0.52 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 194 | 217 | 232 | 238 | 254 | 259 |
| | l/s | 0.054 | 0.060 | 0.064 | 0.066 | 0.071 | 0.072 |
| | GPM | 0.85 | 0.96 | 1.02 | 1.05 | 1.12 | 1.14 |
| Min Δp kPa | | 14 | 14 | 14 | 14.5 | 14.5 | 14.5 |
| Kvs | | 0.52 | 0.58 | 0.62 | 0.62 | 0.67 | 0.68 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 259 | 266 | 280 | 281 | 288 | 294 |
| | l/s | 0.072 | 0.074 | 0.078 | 0.078 | 0.080 | 0.082 |
| | GPM | 1.14 | 1.17 | 1.23 | 1.24 | 1.27 | 1.29 |
| Min Δp kPa | | 14.5 | 14.5 | 15 | 15 | 15 | 15 |
| Kvs | | 0.68 | 0.70 | 0.72 | 0.73 | 0.74 | 0.76 |

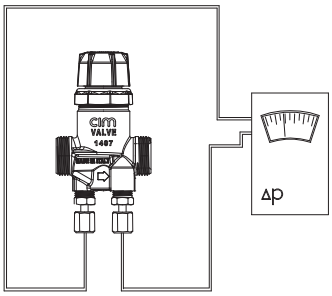
| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 294 | 298 | 300 | 304 | 314 | 347 |
| | l/s | 0.082 | 0.083 | 0.083 | 0.084 | 0.087 | 0.097 |
| | GPM | 1.29 | 1.31 | 1.32 | 1.34 | 1.38 | 1.53 |
| Min Δp kPa | | 15 | 15.5 | 15.5 | 15.5 | 16 | 16.5 |
| Kvs | | 0.76 | 0.76 | 0.76 | 0.77 | 0.78 | 0.86 |



Dimensions in mm

## Flow rates - 3/4" DN 15

ART20C LF




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$

$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 86 | 102 | 122 | 143 | 172 | 194 |
| | l/s | 0.024 | 0.028 | 0.034 | 0.040 | 0.048 | 0.054 |
| | GPM | 0.38 | 0.45 | 0.54 | 0.63 | 0.76 | 0.85 |
| Min Δp kPa | | 13 | 13 | 13.5 | 13.5 | 14 | 14 |
| Kvs | | 0.24 | 0.28 | 0.33 | 0.39 | 0.46 | 0.52 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 194 | 217 | 232 | 238 | 254 | 259 |
| | l/s | 0.054 | 0.060 | 0.064 | 0.066 | 0.071 | 0.072 |
| | GPM | 0.85 | 0.96 | 1.02 | 1.05 | 1.12 | 1.14 |
| Min Δp kPa | | 14 | 14 | 14 | 14.5 | 14.5 | 14.5 |
| Kvs | | 0.52 | 0.58 | 0.62 | 0.62 | 0.67 | 0.68 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 259 | 266 | 280 | 281 | 288 | 294 |
| | l/s | 0.072 | 0.074 | 0.078 | 0.078 | 0.080 | 0.082 |
| | GPM | 1.14 | 1.17 | 1.23 | 1.24 | 1.27 | 1.29 |
| Min Δp kPa | | 14.5 | 14.5 | 15 | 15 | 15 | 15 |
| Kvs | | 0.68 | 0.70 | 0.72 | 0.73 | 0.74 | 0.76 |

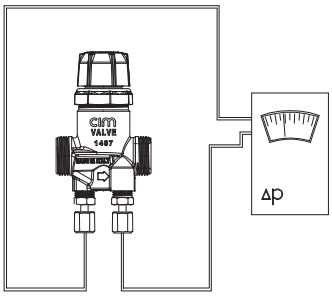
| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 294 | 298 | 300 | 304 | 314 | 347 |
| | l/s | 0.082 | 0.083 | 0.083 | 0.084 | 0.087 | 0.097 |
| | GPM | 1.29 | 1.31 | 1.32 | 1.34 | 1.38 | 1.53 |
| Min Δp kPa | | 15 | 15.5 | 15.5 | 15.5 | 16 | 16.5 |
| Kvs | | 0.76 | 0.76 | 0.76 | 0.77 | 0.78 | 0.86 |



Dimensions in mm

## Flow rates - 3/4" DN15

ART20C HF




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$

$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 96 | 112 | 135 | 155 | 179 | 192 |
| | l/s | 0.027 | 0.031 | 0.037 | 0.043 | 0.050 | 0.053 |
| | GPM | 0.42 | 0.49 | 0.59 | 0.68 | 0.79 | 0.85 |
| Min Δp kPa | | 12.5 | 12.5 | 12.5 | 13 | 13 | 13 |
| Kvs | | 0.27 | 0.32 | 0.38 | 0.43 | 0.50 | 0.53 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 192 | 210 | 234 | 235 | 260 | 261 |
| | l/s | 0.053 | 0.058 | 0.065 | 0.065 | 0.072 | 0.072 |
| | GPM | 0.85 | 0.92 | 1.03 | 1.03 | 1.14 | 1.15 |
| Min Δp kPa | | 13 | 13 | 13.5 | 13.5 | 14 | 14 |
| Kvs | | 0.53 | 0.58 | 0.64 | 0.64 | 0.69 | 0.70 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 261 | 262 | 271 | 284 | 318 | 343 |
| | l/s | 0.072 | 0.073 | 0.075 | 0.079 | 0.088 | 0.095 |
| | GPM | 1.15 | 1.15 | 1.19 | 1.25 | 1.40 | 1.51 |
| Min Δp kPa | | 14 | 14 | 15 | 16 | 17 | 17.5 |
| Kvs | | 0.70 | 0.70 | 0.70 | 0.71 | 0.77 | 0.82 |

| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 343 | 409 | 440 | 456 | 476 | 483 |
| | l/s | 0.095 | 0.114 | 0.122 | 0.127 | 0.132 | 0.134 |
| | GPM | 1.51 | 1.80 | 1.94 | 2.01 | 2.10 | 2.13 |
| Min Δp kPa | | 17.5 | 18 | 18.5 | 19 | 19.5 | 19.5 |
| Kvs | | 0.82 | 0.96 | 1.02 | 1.05 | 1.08 | 1.09 |



Dimensions in mm

## Flow rates - 1" DN20

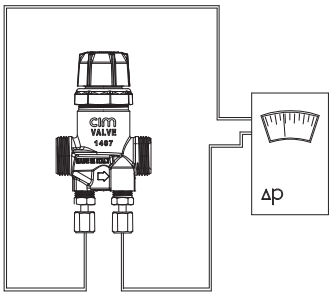
ART20C HF

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 150 | 200 | 244 | 259 | 273 | 315 |
| | l/s | 0.042 | 0.056 | 0.068 | 0.072 | 0.076 | 0.088 |
| | GPM | 0.66 | 0.88 | 1.07 | 1.14 | 1.20 | 1.39 |
| Min Δp kPa | | 18 | 18 | 18.5 | 18.5 | 19 | 19 |
| Kvs | | 0.35 | 0.47 | 0.57 | 0.60 | 0.63 | 0.72 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 315 | 350 | 370 | 380 | 390 | 425 |
| | l/s | 0.088 | 0.097 | 0.103 | 0.106 | 0.108 | 0.118 |
| | GPM | 1.39 | 1.54 | 1.63 | 1.67 | 1.72 | 1.87 |
| Min Δp kPa | | 19 | 19 | 19 | 19 | 19 | 19 |
| Kvs | | 0.72 | 0.80 | 0.85 | 0.87 | 0.89 | 0.98 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 425 | 456 | 475 | 502 | 545 | 590 |
| | l/s | 0.118 | 0.127 | 0.132 | 0.139 | 0.151 | 0.164 |
| | GPM | 1.87 | 2.01 | 2.09 | 2.21 | 2.40 | 2.62 |
| Min Δp kPa | | 19 | 20 | 20 | 21 | 21 | 23 |
| Kvs | | 0.98 | 1.02 | 1.06 | 1.10 | 1.19 | 1.23 |

| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 590 | 610 | 690 | 812 | 885 | 900 |
| | l/s | 0.164 | 0.169 | 0.192 | 0.226 | 0.246 | 0.250 |
| | GPM | 2.62 | 2.69 | 3.04 | 3.58 | 3.90 | 3.96 |
| Min Δp kPa | | 23 | 23 | 24 | 25 | 26 | 26 |
| Kvs | | 1.23 | 1.27 | 1.41 | 1.62 | 1.74 | 1.77 |




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$

$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$



Dimensions in mm

## Flow rates - 1"1/4 DN25

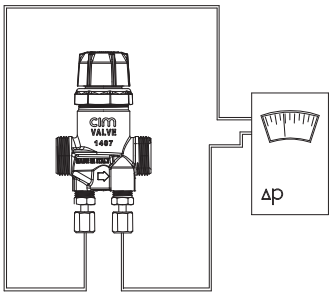
ART20C HF

| Pre-Set | | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 272 | 352 | 400 | 428 | 490 | 592 |
| | l/s | 0.076 | 0.098 | 0.111 | 0.119 | 0.136 | 0.164 |
| | GPM | 1.20 | 1.55 | 1.76 | 1.88 | 2.16 | 2.61 |
| Min Δp kPa | | 18 | 18 | 19 | 19 | 20 | 20 |
| Kvs | | 0.64 | 0.83 | 0.92 | 0.98 | 1.10 | 1.32 |

| Pre-Set | | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 592 | 645 | 700 | 740 | 770 | 882 |
| | l/s | 0.164 | 0.179 | 0.194 | 0.206 | 0.214 | 0.245 |
| | GPM | 2.61 | 2.84 | 3.08 | 3.26 | 3.39 | 3.88 |
| Min Δp kPa | | 20 | 21 | 22 | 23 | 24 | 25 |
| Kvs | | 1.32 | 1.41 | 1.49 | 1.54 | 1.57 | 1.76 |

| Pre-Set | | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 882 | 920 | 950 | 1046 | 1160 | 1200 |
| | l/s | 0.245 | 0.256 | 0.264 | 0.291 | 0.322 | 0.333 |
| | GPM | 3.88 | 4.05 | 4.18 | 4.61 | 5.11 | 5.28 |
| Min Δp kPa | | 25 | 25 | 26 | 26 | 27 | 27 |
| Kvs | | 1.76 | 1.84 | 1.86 | 2.05 | 2.23 | 2.31 |

| Pre-Set | | 4.0 | 4.2 | 4.4 | 4.6 | 4.8 | 5.0 |
|---|---|---|---|---|---|---|---|
| Flow Rate | l/h | 1200 | 1260 | 1345 | 1400 | 1540 | 1610 |
| | l/s | 0.333 | 0.350 | 0.374 | 0.389 | 0.428 | 0.447 |
| | GPM | 5.28 | 5.55 | 5.92 | 6.16 | 6.78 | 7.09 |
| Min Δp kPa | | 27 | 28 | 31 | 32 | 35 | 37 |
| Kvs | | 2.31 | 2.38 | 2.42 | 2.47 | 2.60 | 2.65 |




$\Delta p \geq \Delta p_{min}$ --> $Q = Q_{nom}$

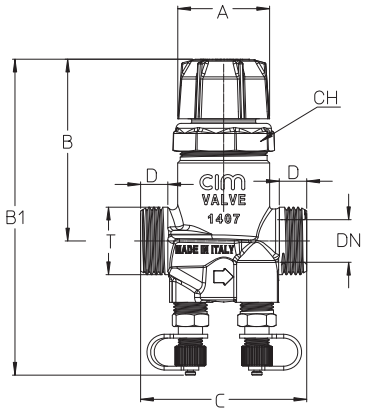
$\Delta p < \Delta p_{min}$ --> $Q = Kvs \sqrt{\Delta p}$



Dimensions in mm

**Main dimensions:**

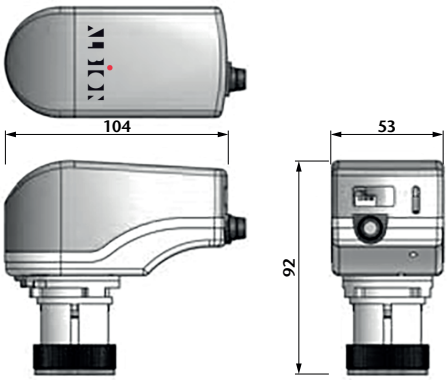
ART20C LF
ART20C HF



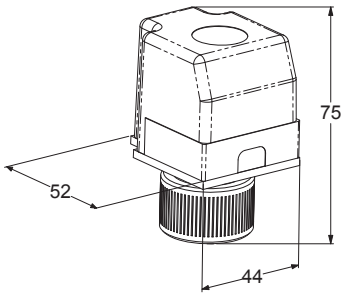

| DN | 10 | 15 | 20 | 25 |
|---|---|---|---|---|
| Grms. | 450 | 490 | 790 | 960 |
| A | 35 | 35 | 35 | 35 |
| B | 75 | 75 | 85 | 83 |
| B1 | 130 | 130 | 150 | 146 |
| C | 53 | 65 | 82 | 104 |
| D | 9 | 11 | 12 | 13 |
| T | G. 1/2" | G. 3/4" | G. 1" | G. 1"1/4 |
| CH | 39 | 39 | 39 | 39 |

**Main dimensions:**

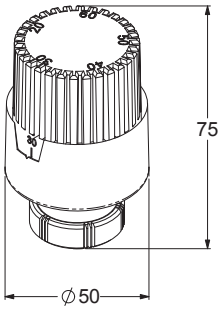
C23E
C21V
C22V
EMV299/100
EMV311/NC
EMV311/NO
EMV311/PRO




C21V/22V/23E




EMV311 series




EMV299 series



Dimensions in mm

**Maintenance:**

As a rule, the balancing valve does not need any maintenance. In case of replacement or need of disassembling of some components of the valve, make sure that the installation is not under service or pressure.

Instructions for disassembling and assembling of the bonnet:

- Disassembling:

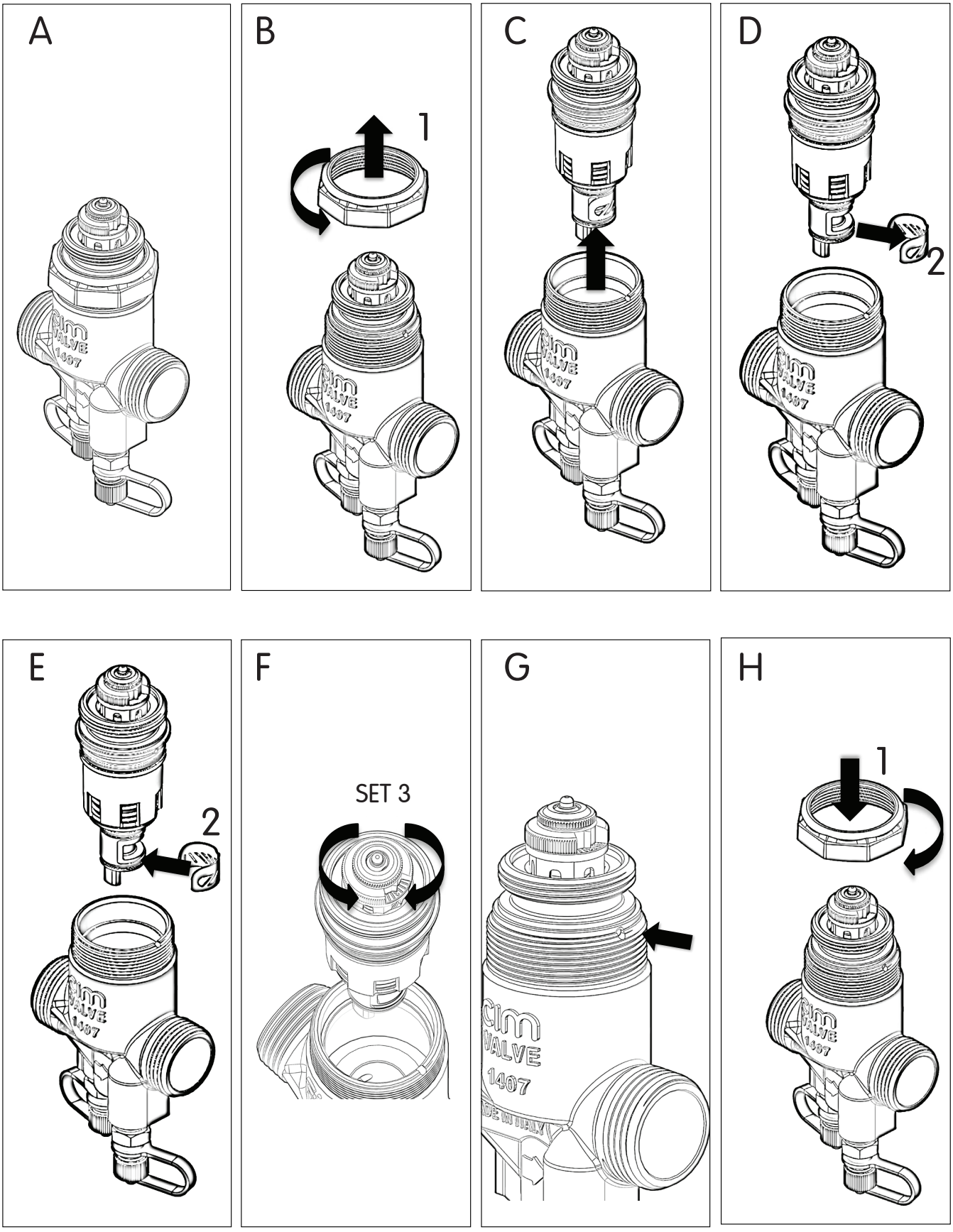
Unscrew the locking nut (1) (B), pull the bonnet out (C),and take the band (2) away (D);

- Assembling:

Replace the band (2) in the seat (E) and guide the regulator into the position No.3 (F), insert the bonnet into the body paying attention to couple the pin of the bonnet with the cavity placed in the upper part of the body (G). Screw the nut with operating torque of 15 Nm (H). Adjust the required flow rate and screw the locking nut.



Dimensions in mm






Dimensions in mm

9a Fallbank Industrial Estate,
Dodworth, Barnsley, S75 3LS

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